

Solving Fractional First Degree Equations

Solving Equations Involving Fractions

Here is an easy method for solving equations involving fractions

Remember that equations are like a scale – as long as you do the same thing to both sides it will remain balanced.

Step 1: Multiply both sides of the equation by the LCD (lowest common denominator)

Step 2: simplify each term and the fractions will disappear

Step 3: Solve as you would any other first degree equation

$$(20)\frac{x}{5} = \frac{3}{4}(20)$$

$$\frac{20x}{5} = \frac{60}{4}$$

$$4x = 15$$

$$\frac{4x}{4} = \frac{15}{4}$$

$$x = \frac{15}{4}$$

$$8\left(\frac{3}{8}y - \frac{1}{4}y = -2\right)$$

$$\frac{24}{8}y - \frac{8}{4}y = -16$$

$$3y - 2y = -16$$

$$y = -16$$

Cross-Multiplying

Cross multiplying is a shortcut for getting rid of the denominators

Cross multiplying is a method used to solve equations involving fractions when you have one fraction = to another fraction

This is the way you do it:

$$\text{if } \frac{a}{b} = \frac{c}{d} \text{ then } ad = bc$$

$$\frac{x}{5} = \frac{3}{4}$$

$$4x = 15$$

$$\frac{4x}{4} = \frac{15}{4}$$

$$x = \frac{15}{4}$$

We are now ready for more challenging examples.

Lesson Notes

Example

1. Solve the following equation:

$$t + \frac{t}{2} = \frac{t}{3} + \frac{t}{4} - \frac{11}{2}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$12 \left(t + \frac{t}{2} = \frac{t}{3} + \frac{t}{4} - \frac{11}{2} \right)$$

$$12t + \frac{6}{\cancel{2}}t = \frac{4}{\cancel{3}}t + \frac{3}{\cancel{4}}t - \frac{12}{\cancel{2}}66$$

$$12t + 6t = 4t + 3t - 66$$

$$12t + 6t - 4t - 3t = -66$$

$$11t = -66$$

$$\frac{11t}{11} = \frac{-66}{11}$$

$$t = -6$$

2. Solve the following equation:

$$\frac{7z}{8} = \frac{-1}{2}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$8 \left(\frac{7z}{8} = \frac{-1}{2} \right)$$

$$\frac{7}{\cancel{8}}z = \frac{-8}{\cancel{2}}$$

$$7z = -4$$

$$\frac{7z}{7} = \frac{-4}{7}$$

$$z = \frac{-4}{7}$$

Lesson Notes

3. Solve the following equation:

$$\frac{2y-6}{3} = \frac{2+y}{4}$$

- Cross Multiply or multiply entire equation by LCD
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$4(2y-6) = 3(2+y)$$

$$8y - 24 = 6 + 3y$$

$$8y - 3y = 6 + 24$$

$$5y = 30$$

$$\frac{5y}{5} = \frac{30}{5}$$

$$y = 6$$

4. Solve the following equation:

$$\frac{6x+3}{7} + \frac{3x-5}{3} = 0$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$21\left(\frac{6x+3}{7} + \frac{3x-5}{3}\right) = 0$$

$$\frac{3\cancel{21}(6x+3)}{\cancel{7}} + \frac{7\cancel{21}(3x-5)}{\cancel{3}} = 0$$

$$3(6x+3) + 7(3x-5) = 0$$

$$18x + 9 + 21x - 35 = 0$$

$$18x + 21x = -9 + 35$$

$$39x = 26$$

$$\frac{39x}{39} = \frac{26}{39}$$

$$x = \frac{26}{39}$$

$$x = \frac{2}{3}$$

5. Solve the following equation:

$$\frac{3r-2}{4} - \frac{r+3}{8} + \frac{11}{16} = \frac{7r-1}{16}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$16 \left(\frac{3r-2}{4} - \frac{r+3}{8} + \frac{11}{16} = \frac{7r-1}{16} \right)$$

$$\cancel{16}^4 \frac{(3r-2)}{\cancel{4}} - \cancel{16}^2 \frac{(r+3)}{\cancel{8}} + \frac{\cancel{16}(11)}{\cancel{16}} = \frac{\cancel{16}(7r-1)}{\cancel{16}}$$

$$4(3r-2) - 2(r+3) + 11 = 7r-1$$

$$12r - 8 - 2r - 6 + 11 = 7r - 1$$

$$12r - 2r - 7r = -1 + 8 + 6 - 11$$

$$3r = 2$$

$$\frac{3r}{3} = \frac{2}{3}$$

$$r = \frac{2}{3}$$